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## **SECTION 6: EXISTING WASTEWATER SYSTEM**

### **6.1 ONSITE SYSTEMS**

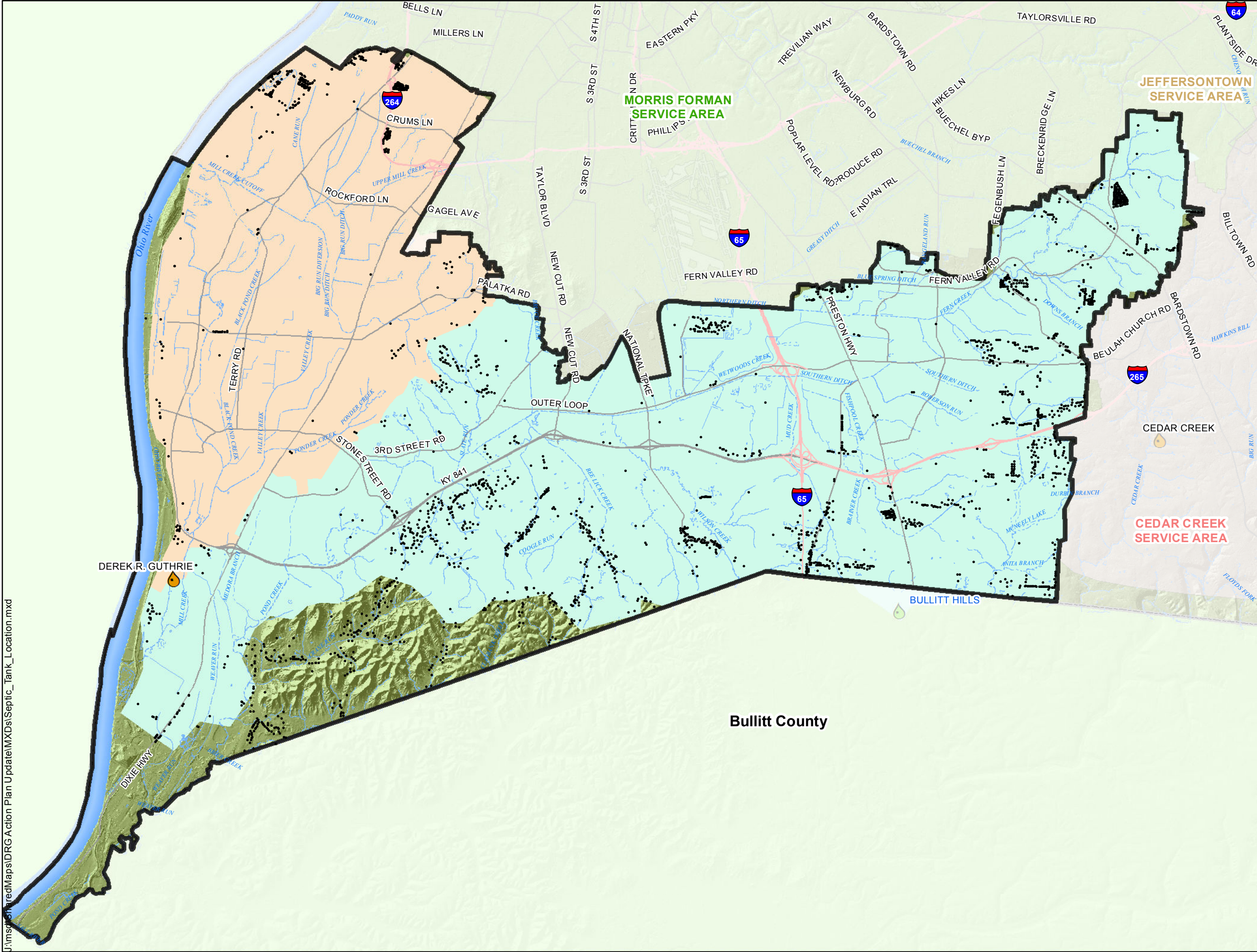
The DRG WQTC planning area contains sections in extreme southern and southwest Jefferson County that have on-site treatment systems, mostly septic tanks. These on-site wastewater treatment systems exist in areas yet to receive sewer service. One focus of this report has been planning and implementing sewer extensions to provide sewer service to these areas so that on-site systems will be eliminated. LOJIC data was used to estimate the number of addresses using septic tanks or other on-site treatment methods. The number of on-site treatment systems is the total number of addresses from the LOJIC database minus the total number of addresses estimated using MSD or private treatment facilities. It is estimated that 2,877 households are currently utilizing the on-site treatment system in the DRG WQTC planning area. Suspected locations of onsite systems are shown in Figure 6-1. There are no known or reported straight-pipe discharges in the DRG WQTC planning area in Jefferson County.

MSD has eliminated all private package treatment plants within the DRG WQTC planning area. The last remaining private treatment plants were Silver Heights WWTP (KY0029416) and McNeely Lake Treatment WWTP (KY0028801) which were eliminated in 2014 and 2016 respectively.

### **6.2 PHYSICAL CONDITIONS OF EXISTING WASTEWATER TREATMENT PLANTS**

The DRG WQTC planning area includes one regional plant which is a major focus of this facilities plan. Flow projections, presented in Section 7 show projected flows for this planning period.

The DRG WQTC is located at 11601 Lower River Road. The WQTC effluent discharges to the Ohio River at mile point 358.1 (USACE river mile 623.3). The DRG WQTC was issued KPDES Permit No. KY0078956 that specifies the effluent limits for the facility. Table 6-1 summarizes the current KPDES effluent limits.



**Figure: 6-1**

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LOUISVILLE AND JEFFERSON COUNTY  
METROPOLITAN SEWER DISTRICT

**SUSPECTED LOCATIONS  
OF ONSITE SYSTEMS**

- Septic Tanks
- MSD Regional Treatment Plant
- MSD Treatment Plant
- Private Treatment Plant
- Streams
- Expressway
- Major Roads
- Jefferson County Boundary
- Pond Creek Watershed
- Mill Creek Watershed
- Currently Not Serviced
- Planning Area Boundary

00.751.5 Miles

1 inch equals 1.5 miles

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Map Created: 7-APR-2017



Table 6-1 KPDES Permit Limits DRG WQTC

Parameter	Quantity or Loading (lb/day)		Quality or Concentration (mg/L)	
	Monthly Average	Weekly Average	Monthly Average	Weekly Average
Flow, Design (30 MGD)	-	-	Report	Report
Biochemical Oxygen Demand (5-day)	7506	11259	30	45
Total Suspended Solids	7506	11259	30	45
Fecal Coliform Bacteria (N/100 ml)	-	-	200	400
Ammonia (as N)	5004	7506	20	30
Phosphorus (as P)	Report	Report	-	-
TKN (as N)	Report	Report	-	-
<b>Dissolved Oxygen not less than 2.0 mg/L</b>				
Total Residual Chlorine (TRC)	-	-	0.019 Daily Max	0.019 Daily Max
Toxicity, Acute (Quarterly)				1.0 T <sub>ua</sub>
pH Range	6.0-9.0			
% Removal of TSS	85%			
% Removal of BOD	85%			

### 6.2.1 DRG WQTC

The DRG WQTC was constructed to serve the residential, commercial/industrial and public users in the Mill Creek and Pond Creek Watersheds. DRG WQTC has been in service since 1985 with an initial capacity of 15 MGD. An expansion in 2004 increased the design annual average daily flow of 30 MGD. As part of the MSD's IOAP response to the ACD, the facility was expanded to receive peak flows up to 300 MGD, treating peak flows of 200 MGD and pumping flow in excess of 200 MGD to a 17 million gallon flow equalization basin. Excess wet weather flow is stored in the equalization basin until plant capacity exists for treatment, at which time the equalization basin is drained by gravity back into the Raw Wastewater Pump

Station. Construction of the improvements began in 2010 and the Wet Weather Treatment Facility was substantially operational in 2012.

The DRG WQTC is typically operated as a contact stabilization treatment facility. Influent flow receives preliminary treatment via screening and up to 200 MGD is pumped to grit removal. After grit removal, the wastewater flows by gravity to the aeration basin, where it is combined with return sludge in the contact basins. Flow then enters secondary clarification with return sludge entering into the stabilization basin. The clarifier overflow is directed to the sodium hypochlorite disinfection process and removal of chlorine residual before discharge to the Ohio River. The facilities added in 2010 - 2012 include a new 350 MGD screening facility, a new influent pump station with a firm capacity of 205 MGD, a wet weather pump station with a firm capacity of 114 MGD, short-term detention basin and a 17 million gallon flow equalization basin, expanded grit collection, one new aeration basin, six additional clarifiers, and expanded chlorination channels. Figure 6-2 shows a flow schematic of the plant. The design capacity for each treatment process is listed in Table 6-2. The peak flow capacity of the DRG WQTC is 200 MGD. In 2016 the plant averaged 35.0 MGD which is 58.3% of the requested 60.0 MGD permit capacity.

**Table 6-2 Unit Process Design Capacity DRG WQTC**

<b>Unit Process</b>	<b>Description</b>	<b>Firm Capacity</b>	<b>Total Capacity</b>
Bar Screens	3 Screens – 175 MGD each	350 MGD	525 MGD
Raw Wastewater Pumps	8 Pumps – 29.4 MGD @ 68.3 ft TDH	205 MGD	235 MGD
Wet Weather Pumps	3 Pumps – 25 MGD @ 68.4 ft TDH 2 Pumps – 39 MGD @ 67 ft TDH	114 MGD	153 MGD
Grit Basins	4 Basins – 50 MGD each		200 MGD
Aeration Basins	2 Stabilization Basins – 1.98 MG each (No. 3 and 4) 3 Contact Basins – 1.76 MG each (No 1, 2 and 5)		200 MGD
Clarifiers	12 Clarifiers – 130 ft diameter, 1.36 MG each		200 MGD
Secondary Sludge Pumps	2 pumps – 27 MGD 2 pumps - 8 MGD	43 MGD	70 MGD

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Chlorine Contact	4 Basins – 50 MGD each		200 MGD
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\*Firm capacity applies to pumping facilities and is calculated with the largest one unit out of service.

Following is a unit process description of the existing water quality treatment center.

### 6.2.2 Raw Wastewater Pump Station

The Raw Wastewater Pump Station (RWPS) was constructed as part of the 2010 – 2012 expansion. The new influent pump station is equipped with 3 bar screens and 8 submersible pumps. For additional equipment specifications see Table 6-2. The structure and all equipment were commissioned in 2012. There are no known condition deficiencies that need to be addressed in the RWPS.

### 6.2.3 Wet Weather Pump Station

The Wet Weather Pump Station (WWPS) is located downstream from the RWPS. Screened raw wastewater that exceeds the capacity of the RWPS will flow by gravity through the Wet Weather Screening Building (WWSB) to the WWPS, where it is pumped to the Short Term Detention Basin (STDB). The WWPS has 3 pumps rated at 25 MGD and 2 pumps rated at 39 MGD, for a firm capacity of 114 MGD. All pumps were either new or totally reconditioned as part of the 2010 – 2012 expansion. During facility commissioning, vibration in excess of specified limits was identified. As of March 2017 this issue has still not been corrected, but MSD is working with the Contractor and the pump supplier under the terms of the construction contract to correct this condition.

The WWPS has identified deficiencies that are currently being addressed with the replacement of damaged switch gear. Additional manufacturer's equipment testing will be performed to address any other operational deficiencies. The heating, ventilation and air conditioning (HVAC) systems and elevators for both WWPS and WWSB have exceeded their original design life and should be considered for refurbishment or replacement. The WWSB building's drain system, including drain pumps, should be rebuilt. In addition, the screens in the WWSB were not anticipated to be used following the expansion. They were left in place following the expansion but were not refurbished. These screens should be considered for complete refurbishment if operating experience shows them to be useful in the expanded treatment process.

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#### 6.2.4 Facility Operations

Under normal operating conditions, flow up to 200 MGD is supplied to the plant by the RWPS. From there it is pumped, to the RWPS North Flow Splitter Box, through the influent channel, to one or more of the four grit removal basin influent channels equipped with Parshall flumes. In wet weather event flows in excess of 200 MGD, up to an additional 100 MGD is pumped by the WWPS to the WWPS Receiving Structure, where it flows to the Short Term Detention Basin (STDB). When the STDB is full, wastewater flows by gravity to the equalization basin (EQB). Ultimately, the capacity of the WWPS will be increased from the current 100 MGD to 150 MGD, bringing the total wet weather capacity of the plant to 350 MGD. It is not expected that this expansion will be required during the planning period covered by this RFP.

If the RWPS needs to be taken out of service for any reason, the WWPS can be used to supply flow to the plant at a rate up to 100 MGD. This can be accomplished by raising (closing) the gate on the RWPS Receiving Structure to isolate the RWPS and lowering (opening) the gate on the WWPS Receiving Structure to allow flow to enter the plant.

#### 6.2.5 Grit Removal Facilities

The grit removal facilities include four parallel influent channels, Parshall flumes, grit removal basins, mechanisms, and grit pumps. Grit cyclones and grit classifiers are located in the Grit Handling Building. The grit facilities include four identical units capable of processing approximately 50 MGD of flow each.

The total capacity of the combined grit removal facilities is 200 MGD. While this does not provide firm capacity in the conventional sense, grit removal basins can operate for a short time without the grit scrapers and grit pumps, so all grit removal basins are likely to be available for short-term events except under unusual conditions. The capacity for this facility is also the capacity of the RWPS and the downstream secondary facilities. Wet weather influent flows in excess of 200 MGD are pumped to the STDB and/or the EQB by the WWPS.

The new grit handling facilities were commissioned in 2012. The existing grit handling equipment has received regular preventive maintenance and is functioning as intended. Future improvements should consider adding coarse bubble diffusers into the grit influent channel to maintain grit suspension. The HVAC system for the Grit Building should be considered for rehabilitation or replacement. There is a capacity issue with isolating flow from the grit basins to the aeration basins. The connection between the grit basins and the aeration basins is four

42-inch diameter pipes. These pipes are the controlling bottleneck that limits overall plant flow to 200 MGD. This condition should be monitored during wet weather events, and if it becomes serious enough to restrict flow below the rated peak flow of 200 MGD, process piping modifications should be made to eliminate this restriction. In addition, two of the 42-inch lines do not have the ability to be isolated from the grit tanks and the aeration basins. Sluice gates should be added to each end of the 42-inch lines that do not have them, to match the other two that can be isolated for maintenance and inspection.

#### 6.2.6 Aeration Facilities

The activated sludge system typically operates in a contact stabilization mode. The return sludge from the secondary clarifiers passes through the stabilization basins (No. 3 and No. 4) before mixing with the incoming screened and de-gritted wastewater. The only difference between wet weather flow and dry weather flow is how many of the three contact basins are in service. The wet weather flow will mix with the return sludge in similar fashion in the common influent channel to the contact basins. Mixed liquor leaving the contact basin will flow by gravity to the secondary clarifiers via the flow conduits and clarifier control structures.

One of the aeration basins (#5) was commissioned in 2012. The other four basins were completely rehabilitated during that same construction project. There are no known condition deficiencies that need to be addressed in the aeration basins. Currently, however, the aeration basin influent channel can only be isolated from the main flow by installing stop logs to segment the channel. These stop logs are labor-intensive to install, and do not seal well enough to allow extended maintenance activities to be performed. These stop logs should be replaced with slide gates to facilitate channel cleaning and maintenance to be performed routinely.

The aeration blowers serving the contact and stabilization basins are four single stage centrifugal blowers. The blowers draw air from the existing plenum and discharge to the 60-inch aeration header. Flow control is accomplished at each aeration basin. Dissolved oxygen (DO) meters control the aeration basin influent air valves to maintain a preset DO concentration. A series of stainless steel air headers and fine bubble membrane diffusers cover the contact basin floor to allow for good mixing and oxygen transfer. Plant staff report problems with leaking gaskets in the air piping headers and drops. The leaking gaskets waste energy and may eventually interfere with effective control of aeration basin oxygen levels. Note that replacing these gaskets requires a partial shut-down of the aeration system and may require outside contractor resources to complete this work without jeopardizing continuous

treatment. A complete evaluation of the air piping system should be done at this time as well and consideration given to installing cathodic protection to prevent future deterioration of the air piping.

The blower system was replaced in 2011 with all new blowers and controls. There are no known condition deficiencies that need to be addressed in the aeration blower system. Staff have suggested improvements to the ancillary systems (such as adding a closed-loop water system) to improve operability or reduce costs. These suggestions should be considered on their merits and implemented as appropriate.

#### 6.2.7 Secondary Clarifiers

The mixed liquor from the contact basins flows to one of twelve secondary clarifiers, depending on the wet weather flow rate. Each clarifier is rated for approximately 16.7 MGD. The mixed liquor is allowed to settle in the secondary clarifiers and the clear liquid overflows the effluent weirs. Flow to the on-line clarifiers is divided by clarifier control structures from the flow conduits. Effluent from the clarifiers flows by gravity to the disinfection process. Return sludge settled in the secondary clarifiers is pumped back to the stabilization tank(s).

Six of the secondary clarifiers were commissioned in 2012. Three of the other clarifiers are more than 10 years old at the time this RFP was prepared and the remaining three are original equipment that is now more than 25 years old. Replacement of the oldest three mechanisms is planned for calendar year 2017, and replacement or rehabilitation of the three mechanisms that are currently over ten years old may be required later during this planning period.

#### 6.2.8 Return Activated Sludge (RAS)

Process modeling of the secondary treatment system, including the existing and proposed expanded facilities, was performed to predict treatment performance. Successful treatment up to 200 MGD was modeled with a return activated sludge (RAS) pumping rate of 42 MGD. The existing RAS pumping system has a firm capacity of 42 MGD and design is underway to replace the two smaller pumps to provide 72.0 MGD of firm RAS pumping capacity. This will provide up to 120 percent of the 60 MGD design average flow, considering the impact of dilute wet weather diversions on the annual average flow being treated. While this does not meet the design standards recommended by the Ten States Standards, process modeling and model calibration completed as part of the Post Construction Compliance Monitoring program have demonstrated that this RAS rate is more than adequate to meet the process needs when treating



up to 200 MGD of wet weather flow.

The Variable Frequency Drives (VFDs) are also more than 10 years old and reaching the end of their effective service life. The design for the replacement of all VFDs is complete and the construction should start in summer of 2017.

#### 6.2.9 Waste Activated Sludge (WAS)

The modeled wasting rate for the treatment facilities is 1.52 MGD at peak flow and loads. Firm waste activated sludge (WAS) pumping capacity is 1.73 MGD. WAS is pumped to the Solids Holding Tanks on the DRG WQTC site for aerated storage and then pumped to the MF WQTC for processing. The firm pumping capacity from the Solids Holding Tanks is 2.88 MGD. There are no known condition deficiencies that need to be addressed in the waste sludge pumping system, however automation enhancement for better control and monitoring the solids handling. The sludge line will be evaluated for condition assessment in the next 3 years.

#### 6.2.10 Disinfection

Effluent from the secondary clarifiers is injected with liquid sodium hypochlorite just upstream from the Parshall flume. Sodium hypochlorite dosage is based on flow rate through the plant. After each Chlorine Contact Basin (CCB), effluent passes over a rectangular weir into the effluent trough. Sodium bisulfite for dechlorination is injected on the upstream side of these weirs. After dechlorination, the treated wastewater flows by gravity to the discharge point in the Ohio River.

The disinfection system was expanded and rehabilitated during the construction project that was commissioned in 2012. There are minor deficiencies that need to be addressed in the disinfection system such as hydraulic limitations during high flow at the CCB, original hypo and bisulfite tanks should be considered for replacement. The bisulfite tanks should be installed in a temperature controlled enclosure with adequate access for operations and maintenance activities.

### **6.3 DRG WQTC CURRENT FLOWS AND LOADS**

While the service area is made up of separate sanitary sewers, infiltration and inflow does result in a wet weather impact to plant flows. For that reason, an evaluation of annual average daily flows is required over a significant period. Figure 6-3 presents annual average flows for the time period 1997 through 2016. During the years 1997 – 2010, the flows are from the dry



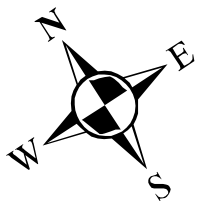
Figure: 6-2

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## DEREK R GUTHRIE WATER QUALITY TREATMENT CENTER

### Flow Type

- Process
- Force Main
- Sanitary Sewer
- Streams
- Flood Gates



0 100 200 Feet  
1 inch equals 200 feet

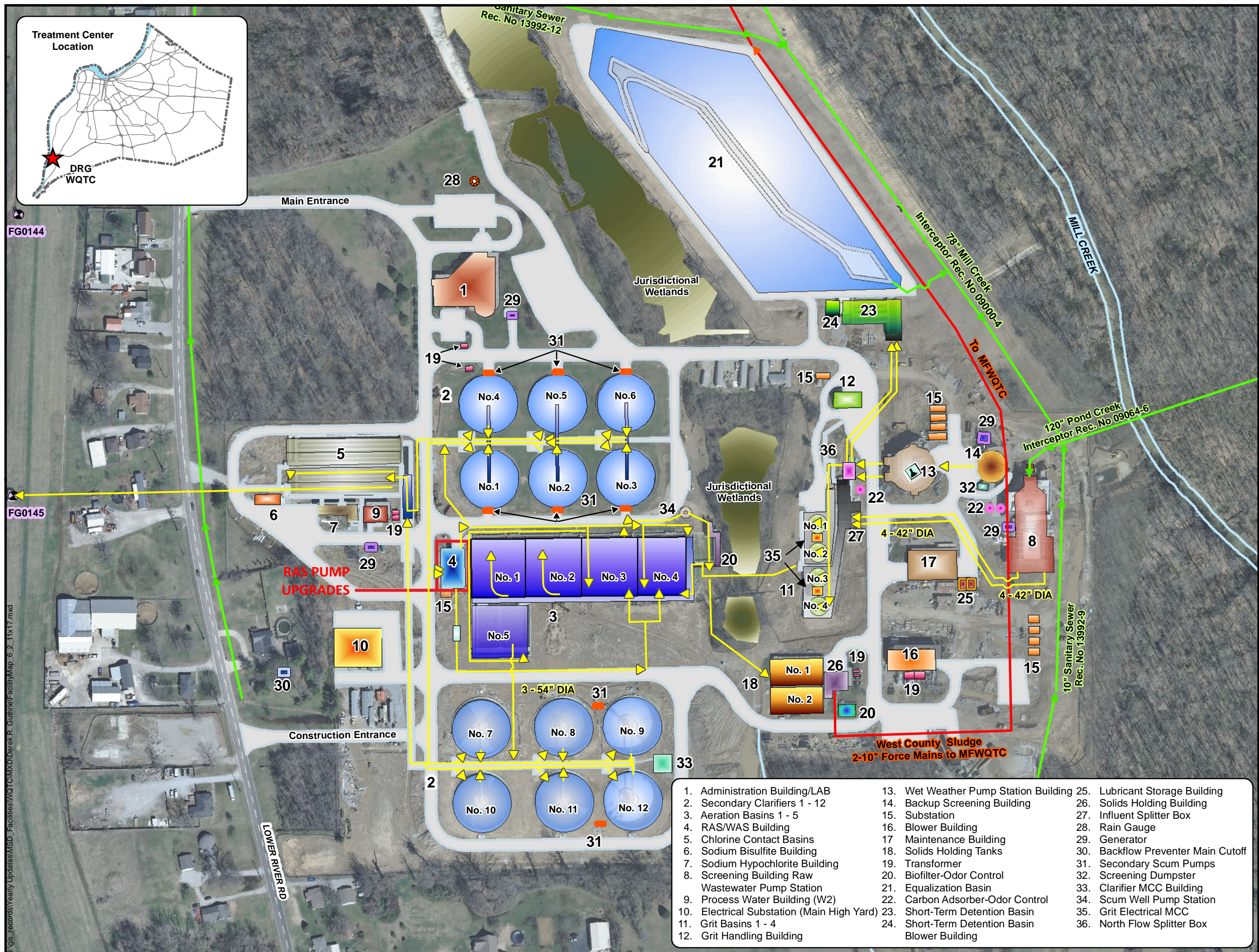
**NOTE:**  
This plan is intended to be a representation of plant flows.  
For more detailed information see Record Drawing No.12484



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Map Prepared by MSD GIS Services and Records

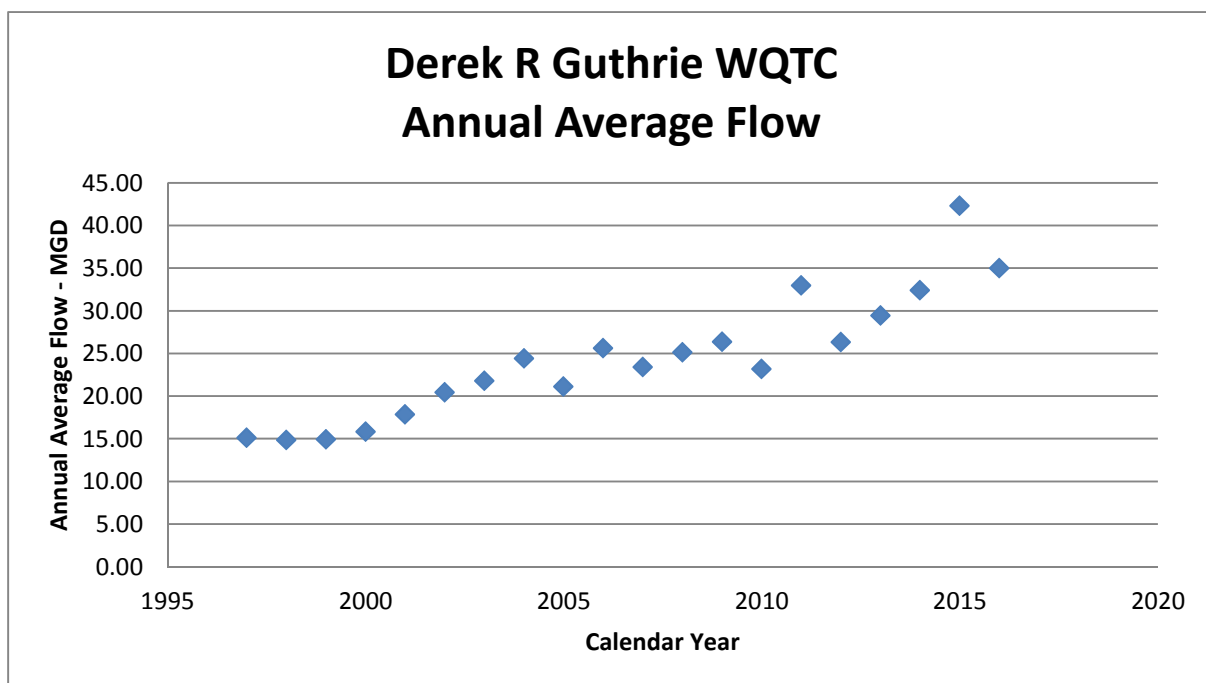
Map Created: 9/27/2017





weather service area only. In 2011, some wet weather flows began to be diverted through the Northern Ditch Interceptor contributing additional flows and increasing overall annual average trends. By the end of 2012 diversion of wet weather flows was routinely practiced during significant rain events.

During wet weather, Integrated Overflow Abatement Plan (IOAP) projects will bring additional portions of the sanitary sewer service area of the Upper Middle Fork basin into the DRG WQTC service area through the Northern Ditch Diversion. The combination of wet weather flow diversions and population growth primarily related to infill of the existing service area may increase the average annual flow contribution from the wet weather service area over the planning period. The impact of wet weather diversions into the DRG WQTC system is addressed in Section 7.



**Figure 6-3 DRG WQTC Annual Average Flows**

## 6.4 EXISTING COLLECTION AND CONVEYANCE SYSTEM

The existing collection facilities and small wastewater treatment plants are described in this section.

#### 6.4.1 Collection Lines

All of the planning area's wastewater collection system is operated and maintained by MSD personnel. Occasionally, local contractors or factory service technicians are used for major repairs that are beyond the capability of the MSD staff. Tables 6-3 through 6-5 characterize the existing conveyance system by size, age and pipe material.

**Table 6-3 DRG WQTC Conveyance System by Size**

<b>Diameter (inches)</b>	<b>Length of Pipe (feet)</b>	<b>%</b>
<8	109,950	2.24%
8	3,605,415	73.53%
10	335,488	6.84%
12	198,534	4.05%
14-27	410,308	8.37%
30-42	120,567	2.46%
48-60	33,238	0.68%
66-100	31,015	0.63%
102-120	58,783	1.20%
Total	4,903,298	100%

**Table 6-4 DRG WQTC Conveyance System by Age of Pipes**

<b>Age of Pipes</b>	<b>Length of Pipe (feet)</b>	<b>Percentage</b>
Built before 1950	1,226	0.03%
1950-1959	87,087	1.78%
1960-1969	932,231	19.01%
1970-1979	670,366	13.67%
1980-1989	336,560	6.86%
1990-1999	1,142,639	23.30%
2000-2009	1,681,622	34.30%
2010-Present	47,801	0.97%
Unknown	3,766	0.08%
Total	4,903,298	<b>100%</b>



**Table 6-5 DRG WQTC Conveyance System by Pipe Material**

<b>Type of Pipe</b>	<b>Length of Pipe (feet)</b>	<b>Percentage</b>
PVC	2,774,701	56.6%
Vitrified Clay Pipe	1,777,544	36.3%
Reinforced Concrete Pipe (RCP)	280,830	5.7%
Cast Iron Pipe (CAS)	22,873	0.5%
CP	20,588	0.4%
CPP	18,540	0.4%
DIP	7,133	0.1%
Polyethylene Pipe (PE)	624	0.01%
Unknown	465	0.01%
<b>Total</b>	<b>4,903,298</b>	<b>100.00%</b>

#### 6.4.2 Pump Stations

Inside of the DRG WQTC dry weather service area; there are a total of 61 pump stations. Of these, 36 are MSD pump stations and 25 are private pump stations that deliver flow to MSD's collection system. Pump design information is not available for all of the privately maintained pump stations. The locations of the pump stations are shown on Figure 3-2. Table 6-6 and 6-7 lists the pump stations, with identification number, type, age and capacity. Several of these are scheduled for elimination and are addressed in the Integrated Overflow Abatement Plan (IOAP).

**Table 6-6 DRG WQTC Pump Stations**

<b>Pumping Station</b>	<b>Station Name</b>	<b>Date of Construction</b>	<b>Lift Station Type</b>	<b>Maximum Pumping Rate (gpd)</b>
MSD1051-PS	Admiral	9/30/1999	Submersible	8,218,080
MSD1143-LS	Bay Harbor Ct	9/24/2003	Submersible	1,676,160
MSD0160-PS	Brandywyne Ct	5/22/1972	Submersible	139,680
MSD0154-PS	Broadfern Drive	2/1/1961	Tank	18,720
MSD1031-PS	Brookbend	2/25/2000	Submersible	203,040
MSD1013-PS	Cinderella	4/4/1995	Submersible	407,520
MSD0048-PS	City Park	NA	Tank	612,000
MSD0130-PS	Cooper Chapel Road	3/1/1963	UGS	626,400
MSD0054-PS	East Rockford Lane	NA	Tank	672,480
MSD1048-PS	Edsel	7/28/1999	Submersible	871,200
MSD1008-PS	Francell	9/15/1978	Tank	198,720
MSD0198-PS	Garden Trace	1/22/1993	Submersible	92,160
MSD0112-PS	Hasbrook	10/24/1995	Submersible	1,242,720
MSD1041-PS	Hillview	6/25/1998	Submersible	113,760
MSD1003-PS	Industrial	8/25/1992	Submersible	1,753,920
MSD0195-PS	Jefferson Hill	11/10/1993	Submersible	41,760
MSD0101-PS	Lantana Drive #1	9/30/1999	Submersible	109,440
MSD1010-PS	Lea Ann Way	5/10/1995	Building	20,808,000
MSD1019-PS	Leven	3/29/1996	Submersible	237,600
MSD0103-PS	Mcneely Lake	7/24/1970	Tank	263,520
MSD0052-PS	Mill Creek	2/27/1962	Submersible	446,400
MSD1147-PS	Mount Washington Road	4/6/2005	Submersible	829,440
MSD1020-PS	Mud Lane	6/5/1999	Submersible	470,880
MSD0164-LS	Oreland Mill	5/31/1972	Tank	688,320
MSD0143-PS	Park Ridge Woods	5/29/1990	Submersible	164,160
MSD1047-LS	Parkwood	11/10/1975	Submersible	110,880
MSD0137-LS	Piccadilly	11/19/1988	Submersible	226,080

**Table 6-6 DRG WQTC Service Area Pump Stations (Continued)**

<b>Pumping Station</b>	<b>Station Name</b>	<b>Date of Construction</b>	<b>Lift Station Type</b>	<b>Maximum Pumping Rate (gpd)</b>
MSD0049-PS	Rosa Terrace	2/28/1962	Tank	302,400
MSD0053-PS	Sanders Lane	2/20/1962	Submersible	151,200
MSD0055-LS	Shively	11/4/1977	Building	17,629,920
MSD0142-PS	Six Mile Lane	3/26/1990	Submersible	41,760
MSD0120-PS	Sunlight	3/23/1988	Submersible	587,520
MSD0140-PS	Tree Line	11/21/1989	Submersible	715,680
MSD0111-LS	Valley Village	8/2/1955	Submersible	612,000
MSD0072-LS	Villa Ana	7/5/1956	UGS	1,010,880
MSD1182-PS	Woodland-Barber	1/13/2005	Submersible	322,560

**Table 6-7 DRG WQTC Service Area Private Pump Stations**

<b>Pumping Station</b>	<b>Station Name</b>	<b>Date of Construction</b>	<b>Lift Station Type</b>	<b>Maximum Pumping Rate (gpd)</b>
88377-LS	All Tune & Lube	2/24/1997	Submersible	Unavailable
42167-PS	Autumn Lake Pump Station	5/18/1995	Submersible	190,080
81844-PS	Board of Education	5/31/1962	Submersible	Unavailable
33883-PS	Cane Run Rd	10/21/1997	Submersible	138,240
55347-PS	Chatamwood Dr	9/1/1973	Submersible	Unavailable
107667-LS	Cherry Blossom	2/18/1987	Submersible	446,400
81642-PS	Chosen Childrens Home	8/31/1987	Submersible	244,800
32626-LS	Dairymart Store	4/1/1996	Submersible	Unavailable
107691-LS	Elderberry Ridge	12/7/1990	Submersible	Unavailable
63573-PS	Fegenbush	6/20/1996	UGS	Unavailable
112832-PS	Global Port	3/12/2007	Submersible	42,336
55303-PS	Harrison FM	7/1/2013	Submersible	Unavailable
55300-PS	Harrison FM	7/1/2013	Submersible	Unavailable
55301-PS	Harrison FM	7/1/2013	Submersible	Unavailable

55302-PS	Harrison FM	7/1/2013	Submersible	Unavailable
92658-PS	Keys Ferry Rd	8/27/2001	Tank	72,000
98652-PS	Midland	9/30/1999	Submersible	Unavailable
34858-PS	Okolona Church	1/19/1995	Submersible	Unavailable
82257-PS	Outer Loop	7/2/1980	Submersible	43,200
50911A-PS	Private Industrial	1/1/1993	Submersible	Unavailable
50911B-PS	Private Industrial	1/1/1993	Submersible	Unavailable
64062-PS	Quail Chase Golf Course		UGS	24,480
35686-LS	Roberta Park MHP	12/14/1963	Submersible	Unavailable
104336B-LS	Shacklette Elementary	10/1/2001	Submersible	Unavailable
58127-PS	Walgreens	3/9/2009	Tank	Unavailable

#### 6.4.3 Existing Biosolids Disposal Method

Sludge generated by MSD WQTCs within the DRG planning area is stored in sludge holding tanks for the short-term and then are pumped from DRG WQTC to the Morris Forman WQTC for further processing and disposal. The ultimate disposal for all sludge generated by MSD WQTCs is a Class A biosolids fertilizer. The biosolids fertilizer product is commercially marketed.

#### 6.4.4 Existing Operation, Maintenance and Compliance Issues

The DRG WQTC has an excellent record of performance, with no KPDES effluent concentration parameter violations in the past 5 years, despite the plant undergoing major construction during that entire time period. The flow diversions from the wet weather service area have increased the flows being treated during wet weather. During periods of extended wet weather the average plant flow can exceed 30 MGD for days or weeks at a time. Since the current KPDES mass loading permit limits are calculated based on an annual average flow of 30 MGD mass loading violations have occurred even though the concentration limits have been met. MSD is currently preparing a request for an updated waste load allocation that can reflect the higher anticipated wet weather flows in the calculation of new mass loading limits for the plant.

The numerous capital projects in recent years have updated, rehabilitated or added process equipment throughout the plant so that there are no known issues with operation, maintenance or compliance with all permitted limits. Under the Capacity, Management, Operations and



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Maintenance (CMOM) program, MSD continually monitors, inspects and insures facilities are operating at or above intended levels of service.

Extraneous water entering the sewer system through infiltration from groundwater sources and through inflow from direct connections reduces the available capacity of sewer systems and treatment facilities. Sewer system evaluation study (SSES) was performed between 2008 and 2018 to establish the baseline condition of the sewer infrastructure for all of MSD sewer and manhole assets. These studies identify I/I locations such as illicitly connected foundation drains, sump pumps, defective cleanouts, and improperly sealed manhole rings and frames and recommendations for remedy of these defects. Rehabilitation projects are developed from the data received from the recurring evaluations to help reduce I/I and increase the capacity of the existing infrastructure.

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## **SECTION 7: FORECASTS OF FLOWS AND WASTE LOADS**

### **7.1 CURRENT AND PROJECTED COMMERCIAL, INDUSTRIAL AND RESIDENTIAL GROWTH**

The criteria to determine land suitable for future development was constructed based on the process used to develop this information for the recently approved Floyds Fork Action Plan Update (FFAPU). The FFAPU criteria were determined after reviewing previous action plans and available information through LOJIC. For consistency, the criteria will be employed in DRG WQTC RFPU. Criteria for future development are listed in Table 7-1.

Once the developable acreage was established, the following assumptions were made:

- There is a density of three houses per developable acre for land zoned as residential.
- Vacant land build out is complete in 40 years.
- Areas with slopes greater than 20 percent will not be developed

Flow calculation based on an average daily flow of 400 gpd per single family equivalent for conveyance projections and 290 gpd per single family equivalent for treatment. The same flow factors were utilized in the approved FFAPU 2010.

**Table 7-1 Criteria for Suitable Land for Development**

<b>Criteria</b>	<b>DRG WQTC Service Area</b>
1. Parcel is larger than 7 acres	X
2. Location is outside of the 100 year flood plain	X
3. Slope is less than 20 percent	X
Parcels exclude:	
Transportation Corridors	X
Parks	X
Golf Courses	X
Conservation Areas	X
Wetlands	X
Cemeteries	X
Established or Planned Subdivisions	X

An Infoworks ICM model that was calibrated to in-system flow monitors was used to model the system response to wet weather and the magnitude of flows that would be received at the plant in both wet weather and dry weather. A full year simulation using data from 2001 was used to determine expected flows. The year of 2001 was statistically considered an average year for rainfall in development of the IOAP. Peak flows at the plant as well as average daily flow were determined using this model. For future development, areas and populations for

each zone were added to new subcatchments within the model. These subcatchments and their future populations were assigned a diurnal pattern similar to the patterns of other neighboring subcatchments with a flow of 290 MGD per home and 3 homes per acre. During the annual simulation, additional wet weather flow from subcatchments would enter the sewer. The flow is based on new development subcatchment parameters that allow a small percentage of the rainfall to enter the system in order to peak flows during rain events. This allowed the model to replicate rainfall responses from new development areas. The subcatchment parameters were developed based on new development areas that have been monitored previously.

When flows dictate and downstream capacity is available, the Upper Middle Fork basin will be diverted into the DRG WQTC service area through the Northern Ditch Diversion. The combination of wet weather flow diversions and population growth primarily related to infill of the existing service area will increase the average annual flow contribution from the wet weather service area over the planning period. In 2012, the wet weather flow diversions began to add to the annual average flow because of the diversion during wet weather. By 2037, the wet weather flow diversions are projected to add 25.3 MGD to the annual average flow, bringing the total annual average flow to 59.9 MGD (with 34.6 MGD coming from the dry weather service area). Although Average Annual Flow is highly dependent on rainfall in any given year, the current Average Annual Flow for 2016 is 34.96 MGD.

The flow projections for the DRG WQTC service area are summarized in Table 7-2, 7-3, and 7-4.

**Table 7-2 Projected DRGWQTC Flow Increases (GPD) by Zone**

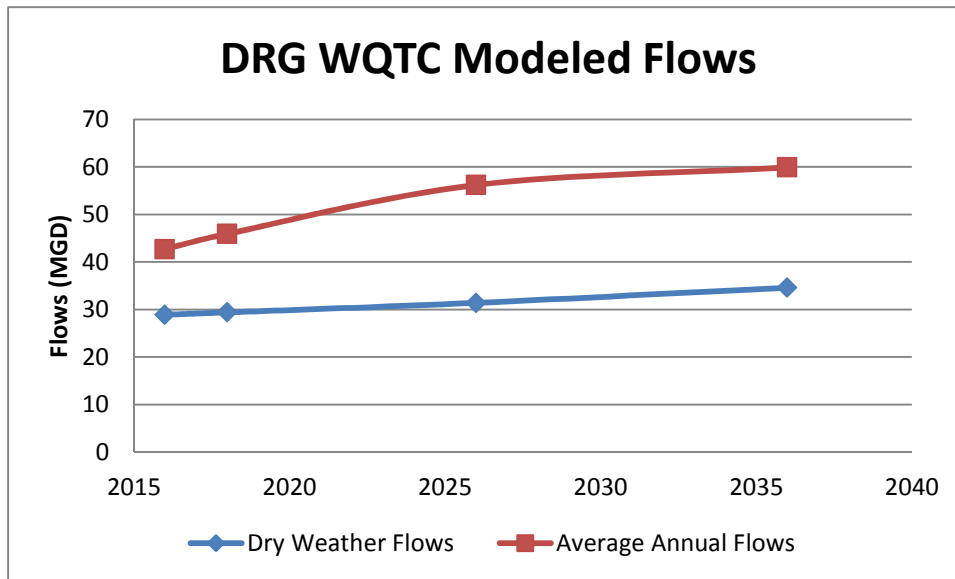
	2 Year Dry Weather Flow	5 Year Dry Weather Flow	10 Year Dry Weather Flow	20 Year Dry Weather Flow	Ultimate Dry Weather Flow
Zone A	98,432	246,080	246,080	246,080	246,080
Zone B	129,749	324,373	605,161	1,815,483	4,560,500
Zone C	2,096	5,240	456,937	1,370,811	3,203,800
Zone D	656	1,640	44,766	134,297	315,000
Zone E	17,990	44,976	363,932	1,091,796	2,592,500
Zone F	4,560	11,400	4,629	13,886	43,800
Zone G	640	1,600	127,286	381,857	892,600
<b>Total</b>	<b>254,124</b>	<b>635,309</b>	<b>1,848,790</b>	<b>5,054,210</b>	<b>11,854,280</b>

**Table 7-3 Modeled Flow Increases to the DRGWQTC**

Year	DWF (MGD)	AAF (MGD)	PF (MGD)
2017	28.9	42.7	251.5
2019	29.4	45.9	255.4
2027	31.4	56.2	270.1
2037	34.6	59.9	284.5

DWF - Dry Weather Flow

AAF - Average Annual Flow



PF – Peak Flow (Modeled with Wet Weather Service Area Added)

**Figure 7-1 DRG WQTC Modeled Flows**

## 7.2 PROPOSED DESIGN CAPACITY OF THE DEREK R. GUTHRIE WQTC

The design capacity of the DRG WQTC to accommodate growth as described in this RFP is predicated on the wet weather expansion completed under the IOAP. The flows and loadings used to determine the sizing of process units under that project are being used to calculate the capacity for treatment of ADF conditions. These values are shown in Table 6-2 in Section 6 with the current capacity of 30 MGD.



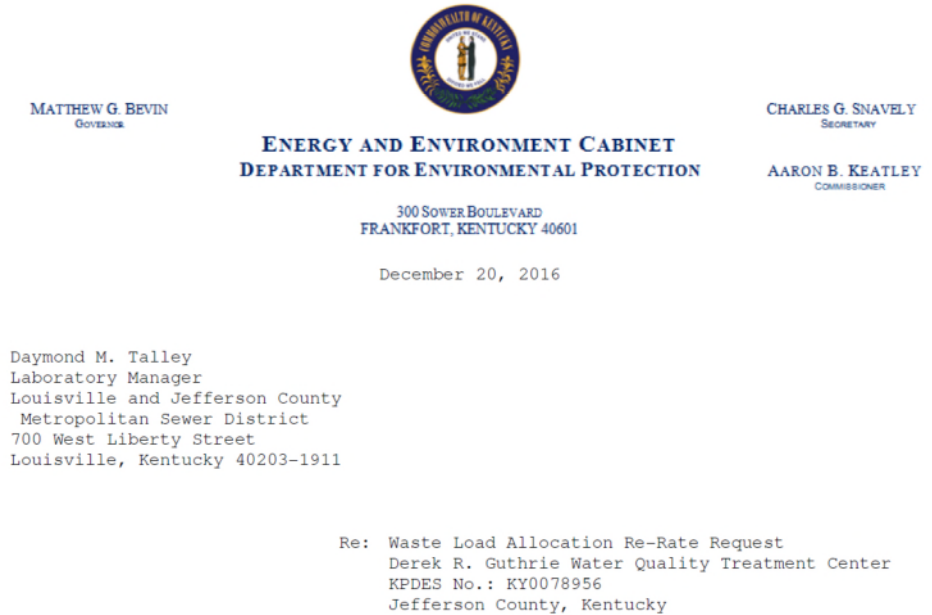
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### **7.3 WASTE LOAD ALLOCATION (WLA)**

A letter requesting an updated WLA was sent to KDOW on November 30, 2016 based on an anticipated expansion of plant capacity to 60 MGD. KDOW responded on December 20, 2016 to the request. See letter below as Figure 7-2.

The effluent discharge for the DRG will remain at mile point 622.4 of the Ohio River. No negative impact is anticipated to water quality in the stream.

Figure 7-2 DRG WQTC WLA December 20, 2016



Dear Mr. Talley:

This is in response to your November 30, 2016 email (attached), requesting a waste load allocation (WLA) for a re-rated Derek Guthrie Water Quality Treatment Center (WQTC). Per your correspondence, a re-rate from 30 MGD to 60 MGD is proposed. Discharge is to remain near 85°54'04.85" west longitude and 38°05'19.13" north latitude, at National Hydrography Dataset (NHD) River Mile (RM) 622.4 of the Ohio River, segment number 08215.

The division notes that the Ohio River (NHD RM 674.8 to 612.4) is included on the 2014 303(d) List of impaired waters. The impaired uses are: warm water aquatic habitat (partial support), primary contact recreation (non-support), and fish consumption (partial support). Pollutants of concern are: dioxin, PCBs, E. coli, and iron. Suspected sources are: source unknown. State and Federal regulations allow new or expanded discharges into impaired waters only if the discharge will improve, or at least not contribute, to existing impairments. Pending additional information regarding pollutant sources, discharge from a re-rated WQTC, in compliance with applicable Kentucky Pollutant Discharge Elimination System (KPDES) permit limitations and requirements, would not be considered a contributor to existing impairments, and could thus be approved.

Therefore, considering the above information, effluent limitations applicable to the subject re-rated facility are stated below.

Mr. Daymond M. Talley  
Waste Load Allocation Re-rate Request  
Page Two

**Design Capacity = 60 MGD / Discharge to NHD RM 622.4 of the Ohio River**

<u>Parameter</u>	<u>May 1 - October 31</u>	<u>November 1 - April 30</u>
BOD <sub>5</sub>	30 mg/l	30 mg/l
Total Suspended Solids	30 mg/l	30 mg/l
Ammonia Nitrogen	20 mg/l	20 mg/l
Dissolved Oxygen	2 mg/l	2 mg/l
Total Phosphorus	Monitor, mg/l	Monitor, mg/l
Total Nitrogen	Monitor, mg/l	Monitor, mg/l
Total Residual Chlorine	0.019 mg/l	0.019 mg/l
Toxicity	1.0 TUa	1.0 TUa

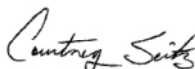
Reliability Classification = Grade C

In addition to the above requirements, the monthly average and weekly maximum values of E. coli shall be at or below 130 colonies per 100 milliliters or 240 colonies per 100 milliliters, respectively, the year around. If a form of chlorine is proposed to disinfect the wastewater, then de-chlorination will likely be needed to achieve the chlorine residual effluent concentration. Additional effluent limitations and water quality standards are contained in 401 KAR Chapter 5 and 401 KAR Chapter 10.

These preliminary design effluent limitations are valid for one (1) year from the date of this letter, and are subject to change as a result of additional information which may be presented during the public notice phase of the Kentucky Pollutant Discharge Elimination System (KPDES) permitting process. As such, this letter does not convey any authorization or approval to proceed with the construction or operation of the proposed wastewater treatment plant. Construction and KPDES permit applications must be submitted to request such authorization or approval. Nor does this letter ensure issuance of either permit. During the review processes of these permits the Division of Water will further evaluate the viability of the project.

Should you have any questions regarding this letter, please contact me at (502) 782-7066 or E-mail at Courtney.Seitz@ky.gov.

Sincerely,



Courtney Seitz, WLA Coordinator  
Wet Weather Section  
Surface Water Permits Branch  
Division of Water

CS  
c: Russell Neal, Water Infrastructure Branch  
Compliance and Technical Assistance  
Branch, Louisville Section  
Division of Water Files